

c. aligning a robotic assembly in the machine in registration with a customer selected one of said beverage container queues;

[c]d. transferring [one of] the visually selected beverage [containers] container from the selected container queue in said upright standing manner to the robotic assembly;

[d]e. carrying the transferred beverage container to a delivery port of the vending machine; and

[e]f. presenting the carried beverage container at the delivery port for customer removal from the vending machine; wherein the entire process is performed without [dropping or] subjecting the container to severe impact forces and while maintaining the selected beverage container in said upright standing position.

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27. (Once Amended) A method of vending discrete products from a vending machine of the type having a transparent viewing panel for customer viewing and selection of the products to be vended, and support means for supportably holding said products for visual presentation to a customer through said viewing panel; comprising the steps of:

a. ordering said products in a plurality of selectable queues of said products on said support means, said products being ordered in standing upright manner so as to be identifiably distinguishable from those of other queues and such that a foremost one of said products in each of said queues addresses the viewing panel at a dispensing end of its associated queue;

b. moving a capture assembly into alignment with the dispensing end of a customer selected one of said queues;

c. transferring the foremost one of said products, in said standing upright manner from said customer selected one of said queues into retainment by said capture assembly;

d. moving said capture assembly with its retained product in view of said viewing panel to a delivery port;

e. enabling customer removal of said retained product from said capture assembly at said delivery port; and

f. wherein the steps of transferring and moving said foremost product from said selected queue to said delivery port are performed while retaining said product in said standing upright manner and without [dropping or] subjecting said foremost product to sharp impact forces.

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37. (Once Amended) A vending machine for beverages packaged in sealed containers, comprising:

- a. a storage facility defining an enclosed internal cavity and a container delivery port opening into said internal cavity;
- b. a container [holding means] holder within said internal cavity [for holding] configured to hold in a queue, a plurality of selectable sealed beverage containers in upright standing manner; said container [holding means] holder being disposed so as to define with said storage facility a vend selection space within said internal cavity;
- c. a beverage container capture [means] system for retainably removing one of said plurality of selectable beverage containers from said container [holding means] holder in response to a vend control signal;
- d. [transport means] a transporter operatively connected with said beverage container capture [means] system for moving said beverage container capture [means] system within said vend selection space in response to said vend control signal; and
- e. [control means] a controller operatively connected with said capture [means] system and with said [transport means] transporter for producing and providing said vend control signal thereto to cause said capture [means] system and said [transport means] transporter to cooperatively capture a selected beverage container from said container holding means and smoothly carry said captured container in said upright manner through said vend selection space to said delivery port without dropping or subjecting said selected beverage container to sharp impact forces.

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38. (Once Amended) A vending machine for vending selectable products comprising:

- a. a product storage chassis including a door, cooperatively forming an internal cavity; said chassis including a transparent wall panel portion for enabling viewing therethrough into said internal cavity and a product delivery port spaced from said transparent wall panel portion;
- b. a product selector [selection means] operable by a customer for generating a vend control signal indicative of a product selection of the customer;
- c. a support [means] operatively mounted within said internal cavity of the product storage chassis [for supporting] configured to support said products in a plurality of selectable and separate ordered queues of such products, said products being supported in standing upright manner by said support; and

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d. a robotic assembly mounted to said chassis and operatively movable within said internal cavity in response to said vend control signal to rapidly and smoothly remove and carry a selected said product from its associated said ordered queue to said product delivery port without dropping or jarring the selected product, and all while maintaining orientation of said product in said standing upright manner; wherein a customer can visually inspect said products before selection and can view the entire product removal and carrying operations of a vending cycle of the machine through said transparent panel portion.

[Please add new claims 131–161 as follows.]

131. A method for vending beverages packaged in sealed containers, comprising:

a. storing a plurality of packaged beverages in selectable queues of containers of such beverages within a vending machine;

b. aligning a robotic assembly in the machine in registration with a customer selected one of said beverage container queues;

c. transferring one of the beverage containers from the selected container queue to the robotic assembly;

d. carrying the transferred beverage container by said robotic assembly in a generally vertical X-Y plane of travel within said vending machine, to a delivery port of the vending machine; and

e. presenting the carried beverage container at the delivery port for customer removal from the vending machine; wherein the entire process is performed without dropping or subjecting the container to severe impact forces.

132. A method for vending beverages packaged in sealed containers, comprising:

a. storing a plurality of packaged beverages in selectable queues of containers of such beverages in a vending machine;

b. retaining a plurality of said beverage containers in said selectable queues by retainably preventing a first-in-line container from moving out of said queue;

c. aligning a robotic assembly in the machine in registration with a customer selected one of said beverage container queues;

d. transferring one of the beverage containers from the selected container queue to the robotic assembly;

e. carrying the transferred beverage container to a delivery port of the vending machine; and

f. presenting the carried beverage container at the delivery port for customer removal from the vending machine; wherein the entire process is performed without dropping or subjecting the container to severe impact forces.

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133. The method of claim 132, wherein the step of transferring one of the beverage containers from the selected container queue includes releasing said first-in-line container for movement by gravity into said robotic assembly.

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134. The method of claim 133, including retaining a second-in-line and successively aligned ones of said beverage containers in said selected queue from moving in said queue while said first-in-line container is moving into said robotic assembly.

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135. The method of claim 132, wherein said retaining of the first-in-line and other beverage containers within said queue is performed by a passive restraint apparatus requiring no active power consuming components.

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136. A method of vending bottled beverages from a vending machine of the type having a transparent front viewing panel that enables customer viewing of the actual beverages held by the machine and available for vending, comprising the steps of:

a. aligning a plurality of bottled beverages in at least two ordered queues of said beverages;

b. providing a customer selection input identifiable with at least one of said two ordered queues of beverages;

c. smoothly removing a bottled beverage from said one of said ordered queues by means of a robotic assembly in a generally vertical X-Y plane within a vend selection space of the vending machine in response to said customer selection input; and

d. moving said removed bottled beverage to a delivery port of the machine; wherein said removing and moving steps are smoothly performed without dropping or subjecting the bottled beverage to sharp impact forces.

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137. A method of vending bottled beverages from a vending machine of the type having a transparent front viewing panel that enables customer viewing of the actual beverages held by the machine and available for vending, comprising the steps of:

- a. aligning a plurality of bottled beverages in at least two ordered queues of said beverages;
- b. providing a customer selection input identifiable with at least one of said two ordered queues of beverages;
- c. removing a bottled beverage from said one of said ordered queues comprising:
 - (i) moving a robotic assembly so as to engage and release an escapement cam mechanism associated with said queue to enable the bottled beverage being removed to slide by gravity along said queue, and
 - (ii)
- d. moving said removed bottled beverage to a delivery port of the machine; wherein said removing and moving steps are smoothly performed without dropping or subjecting the bottled beverage to sharp impact forces.

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138. A method of vending discrete products from a vending machine of the type having a transparent viewing panel for customer viewing and selection of the products to be vended, and support means for supportably holding said products for visual presentation to a customer through said viewing panel; comprising the steps of:

- a. ordering said products in a plurality of selectable queues of said products on said support means such that a foremost one of said products in each of said queues addresses the viewing panel at a dispensing end of its associated queue;
- b. moving a capture assembly into alignment with the dispensing end of a customer selected one of said queues;
- c. transferring the foremost one of said products from said customer selected one of said queues into retainment by said capture assembly by
 - (i) moving said capture assembly to activate an escapement mechanism at the dispensing end of the customer selected one of said queues; and
 - (ii) sliding said foremost one of said products past said escapement mechanism and into said capture assembly;
- d. moving said capture assembly with its retained product in view of said viewing panel to a delivery port;

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e. enabling customer removal of said retained product from said capture assembly at said delivery port; and

f. wherein the steps of transferring and moving said foremost product from said selected queue to said delivery port are performed without dropping or subjecting said foremost product to sharp impact forces.

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139. The method of claim *138* wherein the step of moving said capture assembly to engage said escapement mechanism comprises rotating said capture assembly about a generally horizontal pivot axis.

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140. A method of vending discrete products from a vending machine of the type having a transparent viewing panel for customer viewing and selection of the products to be vended, and support means for supportably holding said products for visual presentation to a customer through said viewing panel; comprising the steps of:

a. ordering said products in a plurality of selectable queues of said products on said support means such that a foremost one of said products in each of said queues addresses the viewing panel at a dispensing end of its associated queue;

b. moving a capture assembly into alignment with the dispensing end of a customer selected one of said queues within a vertical alignment accuracy of better or equal to 1/32 inch;

c. transferring the foremost one of said products from said customer selected one of said queues into retainment by said capture assembly;

d. moving said capture assembly with its retained product in view of said viewing panel to a delivery port;

e. enabling customer removal of said retained product from said capture assembly at said delivery port; and

f. wherein the steps of transferring and moving said foremost product from said selected queue to said delivery port are performed without dropping or subjecting said foremost product to sharp impact forces.

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141. The method of claim *140*, wherein the step of moving the capture assembly into alignment comprises moving the capture assembly with at least one gear drive motor.

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141 142. The method of claim *141*, wherein said gear drive motor operatively engages a rack member.

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143. A method of vending discrete products from a vending machine of the type having a transparent viewing panel for customer viewing and selection of the products to be vended, and support means for supportably holding said products for visual presentation to a customer through said viewing panel; comprising the steps of:

- a. ordering said products in a plurality of selectable queues of said products on said support means such that a foremost one of said products in each of said queues addresses the viewing panel at a dispensing end of its associated queue;
- b. moving a capture assembly generally along X and Y coordinates of a generally vertical X-Y plane by rack and pinion drive members, into alignment with the dispensing end of a customer selected one of said queues;
- c. transferring the foremost one of said products from said customer selected one of said queues into retainment by said capture assembly;
- d. moving said capture assembly with its retained product in view of said viewing panel to a delivery port;
- e. enabling customer removal of said retained product from said capture assembly at said delivery port; and
- f. wherein the steps of transferring and moving said foremost product from said selected queue to said delivery port are performed without dropping or subjecting said foremost product to sharp impact forces.

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141 144. A vending machine for beverages packaged in sealed containers, comprising:

- a. a storage facility defining an enclosed internal cavity and a container delivery port opening into said internal cavity;
- b. a container holder within said internal cavity for holding a plurality of selectable sealed beverage containers; said container holder being disposed so as to define with said storage facility a vend selection space within said internal cavity;
- c. a shelf operatively mounted within said internal cavity for maintaining said beverage containers in a plurality of selectable queues such that a discharge end of said queues is positioned adjacent said vend selection space;

d. a beverage container capture system for retainably removing one of said plurality of selectable beverage containers from said container holder in response to a vend control signal;

e. a container release operatively connected with at least one of said queues adjacent said discharge end thereof for selectively retaining said beverage containers in said one queue; said container release including a cam assembly constructed and arranged to cooperatively engage with said capture system; said beverage container capture system being cooperatively engagable with said container release of said one queue for activating said container release when removing a container from said container holder;

f. a transporter operatively connected with said beverage container capture system for moving said beverage container capture system within said vend selection space in response to said vend control signal; and

g. a controller operatively connected with said capture system and with said transporter for producing and providing said vend control signal thereto to cause said capture system and said transporter to cooperatively capture a selected beverage container from said container holder and smoothly carry said captured container through said vend selection space to said delivery port without dropping or subjecting said selected beverage container to sharp impact forces.

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145. A vending machine for beverages packaged in sealed containers, comprising:

a. a storage facility defining an enclosed internal cavity and a container delivery port opening into said internal cavity;

b. a container holder within said internal cavity for holding a plurality of selectable sealed beverage containers; said container holder being disposed so as to define with said storage facility a vend selection space within said internal cavity;

c. a beverage container capture system for retainably removing one of said plurality of selectable beverage containers from said container holder in response to a vend control signal;

d. a transporter operatively connected with said beverage container capture system for moving said beverage container capture system within said vend selection space in response to said vend control signal; said transporter comprising a rack and pinion system for operatively moving said beverage container capture system in said vend selection space relative to said container holder; and

e. a controller operatively connected with said capture system and with said transporter for producing and providing said vend control signal thereto to cause said capture

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system and said transporter to cooperatively capture a selected beverage container from said container holder and smoothly carry said captured container through said vend selection space to said delivery port without dropping or subjecting said selected beverage container to sharp impact forces.

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146. The vending machine of Claim 145, wherein said rack and pinion system includes at least one gear track and at least one dc motor having an output gear for cooperatively engaging said gear rack, and wherein said dc motor is operatively connected for energization by said vend control signal.

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147. A vending machine for beverages packaged in sealed containers, comprising:

- a. a storage facility defining an enclosed internal cavity and a container delivery port opening into said internal cavity;
- b. a container holder within said internal cavity for holding a plurality of selectable sealed beverage containers; said container holder being disposed so as to define with said storage facility a vend selection space within said internal cavity;
- c. a beverage container capture system for retainably removing one of said plurality of selectable beverage containers from said container holder in response to a vend control signal;
- d. a transporter operatively connected with said beverage container capture system for moving said beverage container capture system within said vend selection space in response to said vend control signal; said transporter having an X-Y drive apparatus for accurately moving said capture system in two orthogonal directions within said vend selection space; and
- e. a controller operatively connected with said capture system and with said transporter for producing and providing said vend control signal thereto to cause said capture system and said transporter to cooperatively capture a selected beverage container from said container holder and smoothly carry said captured container through said vend selection space to said delivery port without dropping or subjecting said selected beverage container to sharp impact forces.

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148. A vending machine for vending selectable products comprising:

- a. a product storage chassis including a door, cooperatively forming an internal cavity; said chassis including a transparent panel portion for enabling viewing therethrough into said internal cavity and a product delivery port spaced from said transparent panel portion; said

product delivery port including a door and a power operator operatively connected with said door for opening and closing of said door relative to said delivery port, said power operator including a rack and pinion opening and closing apparatus;

b. a product selector operable by a customer for generating a vend control signal indicative of a product selection of the customer;

c. a support operatively mounted within said internal cavity of the product storage chassis for supporting said products in a plurality of selectable and separate ordered queues of such products; and

d. a robotic assembly mounted to said chassis and operatively movable within said internal cavity in response to said vend control signal to rapidly and smoothly remove and carry a selected product from its associated ordered queue to said product delivery port without dropping or jarring the selected product; wherein a customer can view the entire product removal and carrying operations of a vending cycle of the machine through said transparent panel portion.

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149. A vending machine for vending selectable products comprising:

a. a product storage chassis including a door, cooperatively forming an internal cavity; said chassis including a transparent panel portion for enabling viewing therethrough into said internal cavity and a product delivery port spaced from said transparent panel portion;

b. a product selector operable by a customer for generating a vend control signal indicative of a product selection of the customer;

c. a support operatively mounted within said internal cavity of the product storage chassis for supporting said products in a plurality of selectable and separate ordered queues of such products; and

d. a robotic assembly mounted to said chassis and operatively movable within said internal cavity in response to said vend control signal to rapidly and smoothly remove and carry a selected product from its associated ordered queue to said product delivery port without dropping or jarring the selected product; said robotic assembly comprising:

(i) an X-Y support frame mounted in said chassis and at one end of said support;

(ii) a shuttle, movably mounted to said X-Y support frame for controlled rapid uniform movement therealong in an X direction;

(iii) a carriage assembly operatively connected to said shuttle for controlled movement therealong in a Y direction;

(iv) a capture mechanism operatively mounted to said carriage assembly for removing and carrying said selected product from its associated ordered queue;

wherein a customer can view the entire product removal and carrying operations of a vending cycle of the machine through said transparent panel portion.

148 *147*
150. The vending machine of Claim *149*, wherein said shuttle is mounted to said X-Y support frame by a rack and pinion assembly.

149 *148*
151. The vending machine of Claim *150*, wherein said rack and pinion assembly includes:

- a. a pair of spaced generally horizontal racks forming a part of said X-Y support frame, said horizontal racks being positioned adjacent upper and lower portions of said internal cavity;
- b. a pair of spur gears cooperatively mounted to said shuttle for simultaneous movement and respectively operatively engaging said pair of spaced racks; and
- c. an X-drive motor mounted to said shuttle and having an output gear operatively engaging one of said spur gears; wherein said X-drive motor moves said shuttle in the X-direction along said horizontal racks.

150 *148*
152. The vending machine of Claim *151*, wherein said X-drive motor is a reversible dc motor.

151 *148*
153. The vending machine of Claim *150*, wherein said carriage assembly is operatively connected to said shuttle by a rack and pinion assembly.

152 *147*
154. The vending machine of Claim *149*, wherein said carriage assembly is operatively connected to said shuttle by a rack and pinion assembly.

153 *152*
155. The vending machine of Claim *154*, wherein said rack and pinion assembly includes:

- a. a generally vertical rack mounted to said shuttle;

- b. a slide assembly slidably connecting said carriage assembly to said shuttle, for movement in said Y-direction;
- c. a drive gear cooperatively engaging said vertical rack; and
- d. a Y-drive motor mounted to said carriage assembly and operatively connected to move said drive gear; wherein said Y-drive motor moves said carriage in the Y-direction along said vertical rack and slide assembly.

154 *153*
156. The vending machine of Claim *155*, wherein said Y-drive motor is a reversible dc motor.

155 *154*
157. The vending machine of Claim *156*, further including a power system for energizing said Y-drive motor with a pulse-width-modulated signal in response to said vend control signal.

156 *152*
158. The vending machine of Claim *149*, wherein said capture mechanism of said robotic assembly includes a Z-drive for moving at least a portion of said capture mechanism in a Z-direction, orthogonal to a plane defined by said X and said Y directions.

157 *156*
159. The vending machine of Claim *158*, wherein said support includes at least one release assembly operatively aligned with at least one of said ordered queues of products for selectively releasing said products from said one queue one at a time in consecutive ordered manner; and wherein said capture mechanism activates said release assembly when said capture mechanism moves in said Z-direction.

158 *157*
160. The vending machine of Claim *159*, wherein said release assembly comprises all passive components.

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161. A vending machine for vending selectable products comprising:

- a. a product storage chassis including a door, cooperatively forming an internal cavity; said chassis including a transparent panel portion for enabling viewing therethrough into said internal cavity and a product delivery port spaced from said transparent panel portion;
- b. a product selector operable by a customer for generating a vend control signal indicative of a product selection of the customer;